INSTRUCTIONS FOR USING A SHORT-CUT METHOD FOR CALCULATING THE NUTRITIVE VALUE OF THE DIET

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Short-Cut Method

The short-cut method presented here is designed for use in determining the nutritive value of diets obtained from estimates of food consumption or from records of the amounts of food purchased or furnished by the farm or garden. In an accurate dietary study in which the food consumption figures are based on edible portions and all the waste is weighed and analyzed, instead of using a short method of this kind in which the foods are grouped together, the nutritive value of each foodstuff should be calculated.

The figures and general directions for using the method are presented in Table 1. Groups I, II, and IX are worked out in detail. The other groups are calculated in a similar manner. The directions cover the calculation of nutritive value from weights of foods consumed. Other calculations commonly made in determining the nutritive value of dietaries, such as the reduction of the figures to a per man per day basis, are discussed below under "Food Record Sheet".

This method is formulated on the principle that foods of similar composition may be grouped together, and values for energy, protein, and minerals may be obtained for the groups which will be sufficiently accurate for the analysis of food consumption data in which the margin of error is probably not less than 5 per cent. The foodstuffs commonly appearing in the American diet were therefore divided into nine groups,- two for fatty foods; one for milk; one for meat, fish, and eggs; one that might be called miscellaneous1/; one for sugar and sweets; one for vegetables and fruits; and two for cereals. The groups are shown in detail in Tables 1 and 3. The composition figures on which the method is based are for foods as purchased (A.P.). There is but one exception to this rule, viz., corn on the cob. In applying this method therefore it is necessary to use food consumption figures for foods as purchased. In calculating the food consumption figure for corn on the cob, the original weight (A.P.) should be multiplied by 0.386.

The food composition figures used in working out the method were taken from the following sources: Bulletin 28, Office of Experiment Stations, U.S. Department of Agriculture; Rose's Laboratory Manual of Dietetics; and Sherman's Chemistry of Food and Nutrition.

The method provides for the calculation of calories and grams of protein, calcium, phosphorus, and iron. The nutritive values for each group given in Table 1 have been obtained in some cases by taking in round numbers the nutritive value of the main foodstuffs in the group and in other cases by

1/ The foodstuffs in this group are not necessarily of similar composition. They include those foods which do not fit readily into any of the other groups.

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taking a weighted average of several foodstuffs of approximately equal nutritive value. The foodstuffs are weighted according to their importance in the American diet. In order to bring the nutritive value of some of the foodstuffs in line with the figures for the group in which they appear two relative factors have been worked out. In the first eight groups one factor expresses the calorie value of the foodstuffs relative to the calorie value of the group in which it appears; the other indicates its protein and mineral value relative to the protein and mineral values for the group. In Group IX, cereals, one factor relates to calories, protein, and calcium, and the other to phosphorus and iron. By multiplying the consumption figure for each foodstuff by the appropriate factors, two weights are accordingly obtained, which we have called "Lb-C" (Lbs. consumed x calorie factor) and "Lb.P-M" (Lbs. consumed x protein-mineral factor) respectively for the first eight groups and "Lb.CPC" (Lbs. consumed x calorie-protein-calcium factor) and "Lb.P-Fe" (Lbs. consumed x phosphorus-iron factor) respectively for Group IX.

The sum of the number of Lb.C in each group multiplied by the calorie value for the group gives the total calories furnished by that group. By a similar process the number of grams of protein and minerals furnished by the group is obtained. By adding the figures thus obtained for each group the total nutritive value of the diet is determined.

From the work done in our laboratory we estimate that it takes 1.1 hours to calculate the nutritive value of a dietary by this short-cut method. We are not yet able to give any estimate of its accuracy when applied to individual dietaries. On average food consumption figures for 85 or more families it gives results for the five nutritive factors that are within 5 per cent of those obtained by the long method now in common use.

Certain foodstuffs appearing in unusual amounts will cause inaccuracies in the results. The most outstanding are eggs, cornmeal, navy beans, sweet potatoes, and the foods that make up Group V. For instance, if more than ~~24~~ 16 per cent of the calories of Group IV are furnished by eggs, the calcium value obtained for the group will be too low; if less than ~~13~~ 14 per cent of the calories are furnished by eggs the calcium value of the group will be too high. If a large amount of cornmeal is used in the diet the phosphorus value for Group IX will be low. A large amount of navy beans in the diet causes inaccuracies in the protein, calcium, and iron values, and an unusually large quantity of sweet potatoes causes inaccuracies in the calcium and iron values. It may therefore be necessary to use caution in accepting the results obtained by this short-cut method when the diet varies materially from the average diet.

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TABLE I. SHORT-CUT METHOD FOR OBTAINING NUTRITIVE VALUE OF THE DIET[1]

Group	Factors to be multiplied by lbs. consumed: Cal.	Factors to be multiplied by lbs. consumed: Prot. Min.	Food Value per Lb. C: Cal.	Food Value per Lb. C: Prot.	Food Value per Lb. P-M: Ca.	Food Value per Lb. P-M: P	Food Value per Lb. P-M: Fe	Directions For Using Method: To be applied to lbs. of food consumed
I			4150	4.5	.068	.077	.0009	[Lb. lard + lb. substitute + (lb. butter x .8) + (lb. butter substitute x .85)] x 4150 = calories. Lb. butter + lb. butter substitute gives the figure to be multiplied by the protein and mineral values per Lb.P-M.
Lard	1.0	0						
Substitute	1.0	0						
Butter	.8	1.0						
Substitute	.85	1.0						
II			2600	43	.025	.465	.0065	[Lb. bacon + (lb. salt pork x 1.4) + (lb. sausage x .8)] x 2600 = calories. Lb. bacon + (lb. salt pork x .2) + (lb. sausage x 1.4) gives the figure to be multiplied by the protein and mineral values per Lb.P-M
Bacon	1.0	1.0						
Salt pork	1.4	.2						
Sausage, pork	.8	1.4						
III			315	15	.54	.425	.0011	Similar process
Milk								
whole	1.0	1.0						
skim	.5	1.0						
butter	.5	.9						
evaporated	2.5	2.5						
IV			1200	58	.082	.66	.0091	Similar process
Pork	1.4	1.0						
Mutton	1.0	1.0						
Corned-beef	1.0	1.0						
Poultry	.5	1.0						
Other "	1.0	1.1						
Beef	.8	1.1						
Eggs	.5	1.1						
Fish	.4	1.2						
Veal	.4	1.2						

1/ Developed by Edith Hawley.

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TABLE I (Cont'd.)

Group	Factors to be multiplied by lbs. consumed		Food Value per: Lb. C		Lb. P-M			Directions For Using Method
	Cal.	Prot. Min.	Cal.	Prot.	Ca.	P	Fe	To be applied to lbs. of food consumed
V			2000	135	3.0	3.3	.009	Similar process
Cheese	1.0	1.0						
Cottage cheese	.25	.5						
Cream	.6	.1						
Chocolate	1.3	.5						
Cocoa	1.1	.7						
Peanut butter	1.3	.5						
Nuts	.7	.3						
Cocoanut fresh	.7	.1						
Cocoanut prepared	1.5	.2						
Gelatin	1.0	1.0						
VI			1800	--	.20	.05	.005	Similar process
Sugar	1.0	0						
Brown sugar	1.0	2.0						
Cornstarch	1.0	0						
Honey	.75	1.0						
Sirup	.75	1.0						
Maple sirup	.75	2.0						
Molasses	.75	5.0						
Maple sugar	.8	3.0						
VII			304	8.5	.08	.21	.004	Similar process
Potatoes	1.0	1.0						
Sweet "	1.5	.7						
Seeds	1.0	1.5						
Dry veg.	5.0	8.0						
Leafy veg.	.35	1.0						
Root	.5	1.0						
Other veg.	.35	1.0						
Fruit (a)	.33	.3						
(b)	.8	.5						
Dry Fruit	4.0	2.0						
VIII			1170	42	.12	.42	.004	Similar process
White bread	1.0	1.0						
Brown bread	1.0	1.0						
Peanuts	1.6	2.0						

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TABLE I (Cont'd.)

Group	Factors to be multiplied by lbs. consumed: Cal. Prot. Ca.	Factors to be multiplied by lbs. consumed: P Fe	Food Value per Lb.C: Cal.	Food Value per Lb. P-M: Prot.	Food Value per Lb. P-M: Ca	Food Value per Lb. P-M: P	Food Value per Lb. P-M: Fe	Directions For Using Method: To be applied to lbs. of food consumed
IX			1630	50	.10	.47	.0045	Add the lbs. of cereal consumed and multiply by 1630 to find calories. Multiply the lbs. of cereals consumed by 50 to find gms. of prot. Multiply by .10 to find gms. of Ca. To the sum of the number of pounds of R.C. 1/, and cornmeal consumed add [(lb. W.C. 3 2/ x 3) + (W.C. 4 3/ x 4) + (lb. macaroni x 1.5)] to obtain figure to be multiplied by the phosphorus and iron values per Lb. PF.
Bran	1.0	4.0						
Oatmeal	1.0	4.0						
Shredded wheat	1.0	4.0						
Flour								
Graham	1.0	4.0						
whole wheat	1.0	3.0						
barley	1.0	3.0						
rye	1.0	3.0						
white	1.0	1.0						
Cornmeal	1.0	1.0						
Hominy	1.0	1.0						
Rice	1.0	1.0						
Other breakfast foods	1.0	1.0						
Crackers	1.0	1.0						
Tapioca	1.0	1.0						
Macaroni	1.0	1.5						

1/ R. C. includes white flour, hominy, rice, other breakfast foods, crackers, and tapioca.
2/ W.C.3 includes whole wheat flour, barley flour, and rye flour.
3/ W.C.4 includes bran, oatmeal, shredded wheat, and graham flour.

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THE FOOD RECORD SHEET

In order to facilitate the use of the short-cut method of calculating the nutritive value of dietaries and the reduction of the figures to a per man per day basis, a Food Record Sheet has been prepared, on which all the data pertaining to a dietary may be recorded. A copy of this sheet is enclosed.

The entries on the sheet are divided into three parts, - general information, food consumption data, and nutritive values. The instructions which follow conform to this division.

I. General Information

1. Do not fill in the first line:- record number, cost, calories, protein, calcium, and iron.

2. Fill in name, state, city, college, and date.
The date to be recorded here is the period covered by the study, e.g., 1925.- Dec. 1-7, inclusive.

3. Adult male units.
There are two spaces to be filled in for the number of adult male units, one for energy, the other for protein and minerals. These may be calculated from the double scale presented in Table 2, which was developed in the Bureau of Home Economics in order to allow for the relatively greater need of children for protein and minerals than for calories. The standard for measuring the adequacy of the diet on which the double scale is based is plainly indicated. If the food consumption figures which are being analyzed include waste, suitable allowance should be made in the standard for this factor. If any of the students included in the study are exercising violently for long periods their energy need would probably be that of an active man or woman. If they take very little exercise they would be classed as sedentary.

4. Cost per man per day.
This is obtained by dividing the total cost of the diet by the number of adult male units for calories multiplied by the number of days covered by the study.

II. Food Consumption Data

In the blank "per _____ days" write in the number of days included in the food consumption study.

The nine groups of foodstuffs are not arranged consecutively. This is done to save space. The explanation of the abbreviations used on the food record sheet for the various foodstuffs is given in Table 3. The figures to be recorded under "Lb" and "Cost" are the <u>total</u> amounts for the period studied.

In the columns marked "Lb.C" record the weight obtained by multiplying the number of pounds of each foodstuff consumed by its calorie factor, and in the column marked "Lb.P-M" record the weight obtained by multiplying the number of pounds of each foodstuff consumed by its protein-mineral factor. In some cases, e.g., M-C.B. (meaning mutton and corned beef), the number of pounds of two or more foodstuffs are added together before multiplying by the calorie or protein-mineral factor. In Group IX the first column is marked "Lb.CPC" (meaning lbs. consumed x calorie-protein-calcium factor) and the second is marked "Lb.P-Fe" (meaning lbs. consumed x phosphorus-iron factor).

III. Nutritive values

Lb.C. Record the total number of Lb.C. for each group obtained under "Food Consumption Data".
Cal. Multiply the total number of Lb.C. for each group by its calorie value as given in Table 1.
Lb.P-M. Record the total number of Lb.P-M. for each group obtained under "Food Consumption Data".
Protein. Multiply the total number of Lb.P-M. for each group by its protein value as given in Table 1.
Ca., P., Fe. The values for minerals are obtained by multiplying the number of Lb-P-M for each group by the respective mineral values for the group as given in Table 1.

In Group IX the weight "Lb.CPC" is used in finding the calorie, protein, and calcium values for the groups, and the weight "Lb.P-Fe" is used for ascertaining the phosphorus and iron values.

The sum of the nutritive values of the nine groups gives the total nutritive value of the diet. To find the value per man per day divide the total number of calories by the product of the number of A.M.U. for calories multiplied by the number of days included in the study; and divide the total number of grams of protein and minerals by the product obtained by multiplying the number of A.M.U. for protein and minerals by the number of days included in the study.

Long Method

Calculate the calories, protein, calcium, phosphorus, and iron of the diet by the long method, i.e., for each foodstuff. Find the sum of these factors for each of the nine groups and record in the proper column under "Long Method". They are to be recorded here for comparison with the results obtained by the short method.

Per cent of total calories.

This space provides for the comparison of the nine groups in their energy yield. If you are not interested in making this comparison, you may leave the line blank. If you do make this calculation use the figures obtained by the long method.

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TABLE 2. STANDARD OF FOOD REQUIREMENTS AND A DOUBLE SCALE OF RELATIVE REQUIREMENTS BY AGE, SEX, AND ACTIVITY[1]
Based on Food as Eaten[2]

	For Energy	For Protein and Minerals
	1.0 = 3000 calories	1.0 = 75 gms. Protei = 1.3 gms. P. = 0.69 gm. Ca. = 0.015 gm. Fe
Man - active (Farmer)	1.2	1.1
- moderately active (carpenter, mason)	1.0	1.0
- sedentary (office work)	0.9	1.0
- over 60 - active	1.0	1.0
- moderately active	0.9	0.9
Woman - active	1.0	0.9
- moderately active	0.83	0.83
- sedentary	0.7	0.83
- over 60 - moderately active	0.7	0.7
Boy - 15-18	1.2	1.6
- 11-14	0.9	1.2
Girl - 15-18	0.9	1.2
- 11-14	0.9	1.2
Child - 6-10	0.7	0.9
- under 6	0.4	0.6

1/ The double scale was developed by Edith Hawley in the Bureau of Home Economics, U. S. Department of Agriculture.
2/ The standard does not make allowance for waste in the home or institution.

ILLUSTRATION OF HOW TO USE THE DOUBLE SCALE

Take a family of five consisting of a man who is moderately active, a woma a boy of fifteen, a girl of eleven, and a child of eight. By the use of this table one finds that the energy need of the family is equivalent to that of 4.63 adult male units and its protein and mineral requirements, expressed in terms of the adult male, are 5.53. Assume that the family consumed 5 pounds of milk per day. This would furnish 340 calories per man per day, 13.5 grams of protein, 0.49 gram of calcium, 0.38 gram of phosphorus, and 0.001 gram of iron per man per day.

The following method is used in arriving at these figures. The number of pounds, 5, is divided by the two factors, 4.63 which indicates the calorie need of the family and 5.53 which indicates its protein and mineral requirements. This gives the values 1.08 and 0.9. The former multiplied by 315, the calories in a pound of whole milk, gives 340 calories per man per day. The latter, 0.9, multiplied by 0.546, the number of grams of calcium in a pound of whole milk, gives 0.49 grams of calcium per man per day. The protein, phosphorus, and iron of milk are calculated in the same way as the calcium.

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TABLE 3. EXPLANATION OF FOOD GROUPS AS GIVEN ON FOOD RECORD SHEET.

Group	Abbreviation	Meaning	Abbreviation	Meaning
I	Ld.	Lard	But.	Butter
	B.S.	Butter substitute		
II	Bac.	Bacon	S.P.	Salt pork
	Sau.	Sausage		
III[1]	Wh.M.	Whole milk	E.M.	Evaporated milk
IV	Pk	Pork	M-C.B.	Mutton, corned beef
	Poul.	Poultry	O.P.	Other poultry
	Bf.	Beef	Eg.	Eggs
	F.V.	Fish, veal		
V	Ch.	Cheese	C.C.	Cottage cheese
	Cr.	Cream	C.-Pb.	Chocolate, peanut butter
	Coc.	Cocoa	Nut	Nuts (not including peanuts)
	Cn.	Cocoanut	Gel.	Gelatin
VI[1]	Sg-C.	Sugar, cornstarch	Br.S.	Brown sugar
	H.- S.	Honey, sirup	Mol.	Molasses
VII	Pot.	Potatoes	Sw.P.	Sweet potatoes
	Seed	Seeds[2]	D.V.	Dry vegetables
	Root	Roots[3]	L-OV	Leafy[4], other vegetables
	Fr.a	Fruits a[5]	Fr. b	Fruits b[6]
	D.F.	Dry fruit		
VIII	W.Br.	White bread	B.Br.	Brown breads
	Pn.	Peanuts		
IX	R.C.	Refined cereals[7]	C.M.	Cornmeal
	W.C.3	Whole cereal x 3[8]	W.C.4	Whole cereal x 4[9]
	Mac.	Macaroni		

1. A line is left for other foods in group to be written in. See Table 1.
2. Seeds include green beans (not string), peas, and corn (E.P.).
3. Roots include beets, carrots, onions, and turnips.
4. Leafy vegetables include cabbage, lettuce, celery, and spinach.
5. Fruit a includes peaches, oranges, lemons, watermelon and cantaloupe.
6. Fruit b includes the other fresh fruits.
7. Refined cereals include white flour, hominy, rice, "other" breakfast foods, crackers, and tapioca.
8. Whole cereals to be multiplied by 3 are wholewheat, barley, and rye flours.
9. Whole cereals to be multiplied by 4 are bran, oatmeal, shredded wheat, and graham flour.

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Record No. _____ Cost___ Cal___ Prot___ Ca___ P___ Fe___

FOOD RECORD

Name _____ State _____ City _____ College _____

No. A.M.U.: Cal. _____ P.M. _____ Cost per man per day _____ Date _____

Food Consumption Data for _____ Days

I	Lb.	Lb.C	Lb.P-M	Cost	II	Lb.C	Lb.C	Lb.P-M	Cost	III	Lb.	Lb.C	Lb.P-M	Cost	VIII	Lb.	Lb.C	Lb.P-M	Cost
Ld.					Bac					WhM					W.Br.				
But.					S.P.					E.M.					B.Br.				
B.S.					Sau										Fn.				
Tot.					Tot					Tot					Tot				
IV					V					VI					VII				
Pk.					Ch.					SgC					Pot.				
M-CB					C.C.					BrS					Sw.P				
Poul					Cr.					H-S					Seed				
O.P.					CPb					Mol					D.V.				
Bf.					Coc										Root				
Eg.					Nut					Tot					L-OV				
F-V					Cn					IX	LB.	LB.CPC	Lb.P-Fe	Cost	Fr.a				
					Gel					R.C					Fr.b				
Tot.					Tot					C.M					D.F.				
										WC3					Tot				
										WC4									
										Mac									
										Tot									

Nutritive Values

Group	I	II	III	IV	V	VI	VII	VIII	IX	Total	Per man per day
Lb-C									CPC		
Cal.											
Lb-P-M									PF		
Protein											
Ca.											
P.											
Fe.											
Long :Cal.											
Method :Prot.											
Ca.											
P.											
Fe.											
% of Tot.Cal.											

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Record No. _____ Cost _____ Cal _____ Prot _____ Ca _____ P _____ Fe _____

Food Record from Farmers' Standard of Living Studies

Name _____ State _____ Co. _____ Farm: Kind _____ Value _____ Date _____

Fam. Size: Cal _____ P-M _____ Expen (yr): Total _____ Food _____ Am _____ Fam _____ Adam _____

Per week

	Furnished			Total				Furnished			Total			III	Furnished			Total		
I	Lb.	Lb.C.	Cost	Lb.	Lb.C.	Cost	II	Lb.	Lb.C.	Cost	Lb.	Lb.C.	Cost	Milk	Lb.	Lb.C.	Cost	Lb.	Lb.C.	Cost
Ld							Bac.							Wh						
But.							Sau.													
Tot.							Tot.							Tot.						
IV							V							IX						
PK.							Ch.							Pot						
M-CB							C.C.							Sw.P						
Poul							Cr.							Seed						
O.P.							C-Pb							Root						
Bf							Coc.							L-OV						
Eg							Nut							Fr.a						
F.V.														Fr.b						
Tot.							Tot.							Tot.						
VI							VII													
Sug							Fl													
Br.S							W.C.							D.V.						
H-S.							C.M.							D.F.						
M.SV							R.C.							VIII						
Mol.							Mac.							Br.						
Tot.							Tot.							Tot.						

Food Consumption Per Man Per Week.

	I	II	III	IV	V	VI	VII	VIII	IX	Total
Lb.C-per wk.										
Cal. " "										
Lb.P-M " yr										
Lb.P-M " wk.										
Prot. " "										
Ca " "										
P " "										
Fe " "										
Cost-Furn										
Lb.C-% Furn										
% of Tot.Cal.										
% Cal.Furn										
Vitamin										